



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	
)	
Gurtej S. Sandhu et al.)	Examiner: Erik Kielin
)	
Serial No.: 08/636,069)	Group Art Unit: 2813
)	
Filed: April 22, 1996)	Docket: 303.573US1
)	
For: METHOD TO REDUCE FIXED CHARGE IN CVD OZONE DEPOSITED FILMS)	

APPELLANT'S BRIEF ON APPEAL

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is presented in support of the Notice of Appeal to the Board of Patent Appeals and Interferences, from the Final Rejection of claims of the above-identified application, as set forth in the Final Office Action mailed on September 10, 2003. The Notice of Appeal was received by the Patent and Trademark Office on December 15, 2003. Thus, this Appeal Brief is believed to require a four month extension of time for response based on today's submission date of June 15, 2004.

This Appeal Brief is filed in triplicate. The Commissioner of Patents and Trademarks is hereby authorized to charge Deposit Account No. 19-0743 in the amount of \$330.00 which represents the requisite fee set forth in 37 C.F.R. § 117. Appellant respectfully requests reversal of the rejections of pending claims 1, 2, 4-6, 31, 33-36, and 38-54, withdrawal of all objections, and allowance of the claims and application.

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APPELLANTS' BRIEF ON APPEAL

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1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, MICRON TECHNOLOGY, INC., a Delaware corporation doing business at 8000 South Federal Way, P.O. Box 6, Boise, Idaho 83707-0006.

2. RELATED APPEALS AND INTERFERENCES

There have not been and are not any other appeals nor interferences based on the subject application.

3. STATUS OF THE CLAIMS

Claims 1, 2, 4-6, 31, 33-36, and 38-54 are pending and the subject of the present appeal (see Appendix I). There are no other claims in the application.

4. STATUS OF AMENDMENTS

The claims on appeal stand as finally rejected by the Final Office Action dated September 10, 2003. No amendments have been filed subsequent to the Final Office Action.

5. SUMMARY OF THE INVENTION

The present subject matter relates to integrated circuit manufacturing processes, and in particular relates to a process using ozone for the chemical vapor deposition of doped and undoped SiO₂ films. In general, the process includes the steps of disposing a substrate in a chemical vapor deposition chamber and exposing the substrate surface to a SiO₂ precursor gas, a carrier gas (e.g., one of the noble gases, nitrogen or hydrogen), and optionally a dopant gas in the presence of ozone. The process further includes exposing a reaction volume of gases above the substrate surface to a high intensity light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films. The reactant gases in the reaction volume take part in heterogeneous chemical reactions. The recited process makes it possible to have a functional increase in available atomic oxygen at the substrate surface without increasing the ozone concentration in the gas chamber reaction volume in atmospheric pressure chemical vapor

deposition (APCVD) applications.

6. ISSUES PRESENTED FOR REVIEW

(1) Whether claims 1, 2, 4-6, 31, 33-36, and 38-54 meet the requirement under 35 U.S.C. § 112, first paragraph, in view of the “without directly exposing the substrate to the light source” rejection of paragraph 2 of the Final Office Action.

(2) Whether claims 45 and 50 meet the requirements under 35 U.S.C. § 112, first paragraph, in view of the discussion of paragraph 3 of the Final Office Action

(3) Whether claims 1, 2, 4-6, 31, 33-36, and 38-54 meet the requirements under 35 U.S.C. § 112, first paragraph, in view of the pressure range rejection of paragraph 4 of the Final Office Action.

(4) Whether claims 1, 2, 4-6, 31, 33-36, and 38-54 meet the requirements under 35 U.S.C. § 112, in view of the “without directly exposing the substrate to the light source” rejection of paragraph 5 of the Final Office Action.

(5) Whether the disclosure is sufficient under 37 CFR 1.81(a) and 37 CFR 1.83(a).

(6) Whether claims 31, 33, 34, 38-40, 42, and 52 are unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in view of Hisamune (JP 02-050966) and considered with Bowen et al. (U.S. Patent No. 4,579,750).

(7) Whether claim 34 is unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in view of Hisamune (JP 02-050966) and considered with Bowen et al. (U.S. Patent No. 4,579,750) and further in view of Takabayashi (U.S. Patent No. 5,112,647).

(8) Whether claim 35 is unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in view of Hisamune (JP 02-050966) and considered with Bowen et al. (U.S. Patent No. 4,579,750).

(9) Whether claims 1, 2, 4-6, 41, 43-50, 53, and 54 are unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in view of Hisamune (JP 02-050966) and considered with Bowen et al. (U.S. Patent No. 4,579,750) and further in view of Imai et al. (EP 0 562 625 A2).

7. GROUPING OF CLAIMS

Appellant respectfully submits that the claims do not stand or fall together, since each claim has its own limitations with varying reasons for patentability as set forth herein.

8. ARGUMENT

The contentions of Appellant with respect to the issues presented for review in the foregoing Item 6 and the bases therefor, with citations of the authorities, statutes, and parts of the record relied on, are provided as follows, with each issue being treated under a separate heading.

All traversals and arguments as previously submitted by Appellant in response to the Final Office Action are repeated and incorporated herein by reference, unless explicitly withdrawn. The rejections of the Final Office Action statements regarding the objections and rejections remain respectfully traversed. In requesting reversal of the rejections and withdrawal of the objections, Appellant respectfully submits the following:

The Applicable Law

“A patent may not be obtained...if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.” 35 U.S.C. § 103(a).

A determination of the obviousness or nonobviousness of claimed subject matter is a legal conclusion based on several factual inquiries. These include determining the scope and content of the prior art, ascertaining the differences between the prior art and the claims at issue, and resolving the level of ordinary skill in the pertinent art. *Graham v. John Deere Co.*, 148 U.S.P.Q. 459, 467 (1966); *Winner International Royalty Corp. v. Wang*, 53 U.S.P.Q.2d 1580, 1586 (Fed. Cir. 2000).

In ascertaining the differences between the prior art and the claims, courts are required to consider the claimed invention as a whole. *Panduit Corp. v. Dennison Mfg. Co.*, 1 U.S.P.Q.2d 1593, 1597 (Fed. Cir. 1987). It is impermissible to use the claimed invention as a “template” to piece together the teachings of the prior art to render the claimed invention obvious. *In re Fritch*, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992). The claims must be interpreted in light of the specification, claim language, other claims, and prosecution history. *Panduit*, 1 U.S.P.Q.2d at 1597. A §103 reference must also be considered in its entirety, “including portions that would lead away from the invention.” *Id.* A court must consider not only the similarities, but also the “critical differences between the claimed invention and the prior art.” *In re Bond*, 15 U.S.P.Q.2d 1566, 1568 (Fed. Cir. 1990).

In establishing obviousness, two or more references each containing elements of the claimed invention may be combined, provided all the recited claim elements are met and that there is a suggestion, teaching or motivation to combine the references. *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). Further, even if the prior art provides such a suggestion, motivation or teaching, there must be a reasonable expectation of success for the suggested combination. *In re Vaeck*, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991).

Where inherency is relied upon to establish an element or characteristic of the claimed invention in a reference, the Final Office Action must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent element or characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (B.P.A.I 1990); *Atlas Powder Co. v. Ireco, Inc.*, 51 U.S.P.Q.2d 1943, 1946, 1947 (Fed. Cir. 1999) (emphasis added). A retrospective view of inherency is not a substitute for the required teaching or motivation

to combine references that supports the selection and use of the various elements in the references to arrive at the claimed invention. *In re Newell*, 13 U.S.P.Q.2d 1248, 1250 (Fed. Cir. 1989). Further, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency. *In re Rijckaert*, 28 U.S.P.Q.2d 1955, 1957 (Fed Cir. 1993). Moreover, that which may be inherent is not necessarily obvious because that which may be inherent may not be known, and obviousness cannot be predicated on what is unknown. *Id.* (citing *In re Spormann*, 150 U.S.P.Q. 449, 452 (CCPA 1966)).

It has been held that claimed ranges near the prior art general conditions can render the claimed ranges *prima facie* obvious. *In re Huang*, 40 U.S.P.Q.2d 1685, 1688 (Fed. Cir. 1996). However, this *prima facie* finding of obviousness can be rebutted if the applicant can make a showing of “unexpected results.” *In re Geisler*, 43 U.S.P.Q.2d 1362, 1365 (Fed. Cir. 1997). When claimed ranges are involved, the claimed range must achieve the unexpected results relative to the prior art range. *In re Woodruff*, 16 U.S.P.Q.2d 1934, 1936 (Fed. Cir. 1990). Under this standard, an unexpected result does not arise by discovery of optimum or workable ranges by routine experimentation. *In re Aller*, 105 U.S.P.Q. 233, 235 (CCPA 1955).

(1) Claims 1, 2, 4-6, 31, 33-36, and 38-54 Meet the Requirements under 35 U.S.C. § 112, First Paragraph Enablement, for “Without Directly Exposing the Substrate to the Light Source”

Claims 1, 2, 4-6, 31, 33-36, and 38-54 were rejected under 35 U.S.C. § 112, first paragraph as “containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.”

The rejection of the nonfinal Office Action dated March 24, 2003, which was substantially repeated in the Final Office Action dated September 10, 2003, states:

Each independent claim, 1, 31, 42, 43, 45-48, and 50-53, recites the limitation that the reaction volume of gases located above the substrate within a chemically reactive distance of the substrate is exposed to a light source “without directly exposing the substrate to the light source.” The specification, however, states, that it is not necessary “to illuminate the substrate surface” (p. 7, lines 21-26). As presently written, the amendments to each independent claim, still includes indirectly exposing the substrate such as by reflection off a mirror or a diffraction grating which is *not* supported by the specification. The specification, on the other hand, only supports not illuminating the substrate surface, which *excludes* indirect exposure of the substrate to the light source. Accordingly, the claims as presently written are not supported by the specification because the amended language is not in the specification and furthermore has no basis from the specification for any indirect, or not directly, exposing the substrate to the light source.

Appellant timely traversed such a rejection in the Office Action dated March 24, 2003 and repeats the traversals from the Amendment and Response dated June 24, 2003. The traversals are incorporated by reference herein. Further clarification of the traversal is provided as follows:

The rejection asserted that the claims as presently written are not supported by the specification “because the amended language is not in the specification and furthermore has no basis from the specification for any indirect, or not directly, exposing the substrate to the light source.”

Appellant traverses, since one way to not directly expose the substrate is provided by the specification at page 7, starting at line 21, which states: “The high intensity light energy source needs to be applied only to the reaction volume and can be supplied by an array of lamps arranged to give uniform illumination of the said volume. It is not necessary to illuminate the gas volume in the rest of the CVD chamber or to illuminate the substrate surface.”

As for the assertion that the specification excludes indirect exposure of the substrate, Appellant respectfully traverses on multiple grounds. It is respectfully submitted that the specification relates to a number of illumination embodiments. The preceding quote from the specification at page 7, starting at line 21 states that “it is not necessary to illuminate the gas volume in the rest of the CVD chamber or to illuminate the substrate surface,” but does not exclude such illumination. Additionally, it is believed that indirect illumination of any surface can be possible when a surface is not directly exposed with light and if there exists a possibility that the light can be reflected, scattered or somehow re-radiated to the surface. Such conditions are not precluded by the specification.

Thus, it is believed that the specification does not exclude indirect exposure. Appellant respectfully requests reversal of the rejection of claims 1, 2, 4-6, 31, 33-36, and 38-54.

(2) Claims 45 and 50 Meet the Requirements under 35 U.S.C. § 112, First Paragraph Enablement

The Final Office Action asserts that the cited claims must include "[o]zone or some oxygen source" (Final Office Action at page 3). The rejection cites *In re Mayhew*, 527 F.2d 1229, 188 U.S.P.Q. 356 (CCPA 1976) for authority. Appellant respectfully traverses the rejection. *Mayhew* relates to a lack of a recitation of a cooling zone which was specially located. Appellant respectfully submits that such argument is inapplicable to the introduction of ozone or some oxygen source and that the subject matter of the claims is believed to be properly recited. Furthermore, it is respectfully submitted that the claimed processes are novel and recite "comprising." Such claim language has been deemed to be open-ended and does not preclude other process, including, but not limited to, the introduction of ozone or some oxygen source, consistent with the specification. (MPEP 2111.03) Appellant respectfully requests that the Board reverse the rejections of claims 45 and 50.

(3) Claims 1, 2, 4-6, 31, 33-36, and 38-54 Meet the Requirements under 35 U.S.C. § 112, First Paragraph Enablement, over the Pressure Range Rejection of Paragraph 4 of the Final Office Action

The rejected claims recite in part:

exposing a reaction volume of gases located above the substrate surface within a chemically reactive distance of the substrate to a high intensity light source without directly exposing the substrate surface to the light source. (E.G., claim 1).

The Final Office Action states that:

... the specification, while being enabling for a pressure on the order of 0.01 atmospheres (7.6 Torr), does not reasonably provide enablement for a pressure range of 200 to 760 Torr.

(Final Office Action, paragraph 4, at pages 3 and 4). The Final Office Action then relies on U.S. Patent No. 4,579,750 to Bowen et al. (hereinafter “Bowen”) for requirements to enhance the probability of heterogeneous reactions:

US 4,579,750 (Bowen et al.) teaches that in order to reduce the probability of homogeneous reactions and enhance the probability of heterogeneous reactions, the illuminated region must be focus above the substrate and must be absorbed by the reactive gas molecules “within a few mean free path lengths of the gaseous molecules” of the substrate surface. (See Bowen, col. 3, lines 19-43 – especially lines 32-35.) According to the teaching in Bowen, then, in order only to reduce the probability of homogenous reactions from occurring in the reaction volume, the illuminated region (i.e. the reaction volume) must be only a few mean free path lengths thick.”

Such assertions are, however, believed to be inappropriate on several grounds. It is respectfully submitted that Bowen relates to a process for a substrate which is not heated as recited by the claims and provided by the present specification. The Bowen process includes a relatively “cold” substrate as provided by the following excerpts of Bowen:

“Furthermore, since the only volume where the laser beam reacts with the reactant gas, the remaining portions of the reactant chamber remain at room temperature thereby avoiding contaminants which might occur at elevated temperature.” Bowen, Col. 5, lines 18-24.

“The extremely localized heated gas zone above the substrate will permit the substrate to remain cold.” Bowen, Col. 5, lines 67-69.

“The use of a plastic substrate is believed to have been previously impractical since heretofore, with the use of conventional CVD heat sources, the reaction temperatures are too high for plastics to survive. In the present invention it is possible to heat the reactants and drive the reaction under conditions where the plastic is maintained at a temperature where it is not degraded.” Bowen, Col. 5, line 65 – Col. 6, line 3.

It is noted for the record that at col. 5, lines 25-30, Bowen discusses a heating means embedded in a conveyor belt “so that both the temperature of the reactant gases and temperature of the substrate can be precisely controlled.” Such control is also mentioned at Col. 3, lines 49-51. However, the heating referenced must be at very low temperatures so as to be consistent with the preceding teachings of Bowen and avoid the melting of plastic. Also, according to Col. 3, lines 62-63, the process incorporates “unusually high temperature gradients between heated gas and substrate.” Thus, it is respectfully submitted that the Bowen process is substantially different from that of the recited subject matter where the substrate is heated to at least 480 degrees Celsius to about 700 degrees Celsius.

Additionally, M.P.E.P. 2141.02 states that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (Citing *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir.1983), *cert denied*, 469 U.S. 851 (1984). Thus, the weight of the teachings of an unheated substrate, of a plastic substrate, and reliance on an unusually high temperature gradient are believed sufficient to render Bowen an improper reference for the purposes of this prosecution.

Appellant raised issues of gas temperature in prosecution, but such issues were dismissed by the Final Office Action: "The temperature has no impact whatsoever on the mean free path." Final Office Action, Page 17, line 8. Appellant respectfully submits that where a large gradient in temperature (as relied upon in Bowen) is concerned, it is believed that the macroscopic behavior of particles may well be of a substantially different nature than their microscopic behavior. Thus, it is respectfully submitted that large temperature gradients have a physics which is not easily determinable by equations provided for processes at equilibrium. Consequently, Appellant respectfully submits that Bowen is not analogous art and in fact teaches away from the present subject matter.

The Final Office Action relies upon Bowen substantially for this and the remaining obviousness rejections. For instance, Bowen is used to support the assertion that illumination of the gas would amount to diffraction and "necessarily result in the light source illuminating the substrate – contrary to the requirement in the claims." Final Office Action, Page 5, lines 8-9. Appellant respectfully traverses this assertion, since it relies on Bowen, which was shown to be an improper reference as discussed above.

Thus, withdrawal of the Bowen patent and the numerous assertions made in the Final Office Action and reversal of the rejections is respectfully requested.

(4) Claims 1, 2, 4-6, 31, 33-36, and 38-54 Meet the Requirements under 35 U.S.C. § 112, First Paragraph Written Description, over the Rejection of Paragraph 4 of the Final Office Action

Regarding the issues of Written Description and the rejected claims, the Final Office Action objects to the language "without directly exposing the substrate surface to

the light source." Appellant timely traversed this rejection in prosecution and repeats the above discussion of Sections (1) and (2). It is noted that the above discussion provides support for the claims as they currently stand on appeal, including, but not limited to page 7, lines 15-26 of the specification.

Appellant respectfully requests the Board to overturn the rejection based on written description.

(5) The Disclosure Meets the Requirements under 37 CFR 1.81(a) and 37 CFR 1.83(a)

The Final Office Action asserted drawings are necessary to illustrate "wherein illumination of only the reaction volume, but not the substrate" Appellant believes that the foregoing arguments of Section (3) with respect to Bowen are sufficient to withdraw the rejection's diffraction arguments and to clarify that the illumination recited by the claims and specification in combination with existing FIG. 1 are adequate to understand the claimed subject matter. Withdrawal of this objection is respectfully requested. If upon indication of allowable subject matter, the Office is still of the opinion that additional drawings would be helpful to demonstrate the invention, Appellant is open to discussing additional drawings requested by the Office.

Appellant respectfully requests the Board to withdraw the objection.

(6) Claims 31, 33, 34, 38-40, 42, and 52 are Unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in view of Hisamune (JP 02-050966) and Considered with Bowen et al. (U.S. Patent No. 4,579,750) for a showing of Inherency

The rejection combines Roche, Hisamune, and Bowen to reject claims 31, 33, 34, 38-40, 42, and 52 under 35 U.S.C. 103(a). Appellant respectfully traverses on several grounds.

It is respectfully submitted that none of the cited patents, alone or in combination, provide the recited subject matter. The claims recite heating the substrate and pressure limitations which the cited references teach away from or fail to mention. For instance,

Appellant repeats the discussion above in Section (3) concerning the removal of Bowen for teaching away from a heated substrate and how it is improperly used for rejection of the recited subject matter. Consequently, it is respectfully believed that Bowen is improperly combined in all of the pending rejections under 35 U.S.C. 103 and should be withdrawn.

It is respectfully submitted that Hisamune and Roche fail to provide, among other things, the pressures recited by the rejected claims. For instance, paragraph 7 of the Final Office Action admits "Roche does not teach a pressure in the range of 200 Torr to 760 Torr or more specifically about 200 torr --as further limited by instant claim 38." (Final Office Action at page 9). Appellant is also unable to find pressure limitations in Hisamune as recited by the rejected claims.

The Final Office Action next uses Bowen to assert inherency. In addition to the objections of the use of Bowen, Appellant respectfully submits that the inherency rejection should be withdrawn. Where inherency is relied upon to establish an element or characteristic of the claimed invention in a reference, the Final Office Action must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent element or characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (B.P.A.I 1990); *Atlas Powder Co. v. Ireco, Inc.*, 51 U.S.P.Q.2d 1943, 1946, 1947 (Fed. Cir. 1999) (emphasis added). A retrospective view of inherency is not a substitute for the required teaching or motivation to combine references that supports the selection and use of the various elements in the references to arrive at the claimed invention. *In re Newell*, 13 U.S.P.Q.2d 1248, 1250 (Fed. Cir. 1989). Further, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency. *In re Rijckaert*, 28 U.S.P.Q.2d 1955, 1957 (Fed Cir. 1993). Moreover, that which may be inherent is not necessarily obvious because that which may be inherent may not be known, and obviousness cannot be predicated on what is unknown. *Id.* (citing *In re Spormann*, 150 U.S.P.Q. 449, 452 (CCPA 1966)). Because the Final Office Action's assertion of inherency lacks the requisite details about how the Final Office Action is relying on inherency, it is believed improper. Appellant respectfully requests that the Board withdraw any assertion of inherency based on the present record.

Appellant respectfully submits that the rejection fails to provide adequate motivation or suggestion to combine the references, and that such motivation is unlikely in light of the teachings of Bowen which teach away from the present subject matter. Appellant respectfully requests that the Board reverse the rejections.

(7) Claim 35 is Unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in View of Hisamune (JP 02-050966) and Considered with Bowen et al. (U.S. Patent No. 4,579,750) and Further in View of Takabayashi (U.S. Patent No. 5,112,647)

Appellant respectfully repeats the traversals concerning claim 31 and the impropriety of combination of Roche with Hisanume and Bowen, as set forth above, which is incorporated herein by reference. The Final Office Action admitted Roche in view of Hisanume fails to teach "that helium gas may be the carrier gas." (Final Office Action at page 11). The Final Office Action relied on Takabayashi to fill this deficit. Takabayashi has to do with formation of amorphous silicon. Takabayashi's temperature is "in general . . . between 30° C and 450° C," which lies outside the claimed subject matter. Thus, Appellant believes that Takabayashi does not provide the requisite teachings to the references.

Thus, the combination of Roche with Hisanume, Bowen, and Takabayashi, fails to teach or suggest the claimed subject matter. Appellant respectfully requests that the Board reverse the rejection of claim 35.

(8) Claim 36 is Unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in View of Hisamune (JP 02-050966) and Considered with Bowen et al. (U.S. Patent No. 4,579,750).

The impropriety of combination of Roche with Hisamune and Bowen, as set forth above, is incorporated herein by reference. The Final Office Action admitted Roche in view of Hisamune fails to specify "the amount of ozone used in the deposition of the SiO₂ film." (Final Office Action at page 12), and specifically that "Hisamune is silent to the amount of ozone, such that one of ordinary skill would have to determine how much

to add" (Final Office Action at page 12). The Final Office Action relied on Sato to fill this deficit. Appellant respectfully traverses the combination and submits that for at least the foregoing reasons, the references are not properly combinable.

Appellant respectfully requests that the Board reverse the rejection of claim 36.

(9) Claims 1, 2, 4-6, 41, 43-50, 53, and 54 are Unobvious under 35 U.S.C. § 103(a) over Roche (U.S. Patent No. 4,581,248) in View of Hisamune (JP 02-050966) and Considered with Bowen et al. (U.S. Patent No. 4,579,750) and Further in View of Imai et al. (EP 0 562 625 A2).

The rejection relies on Bowen. The impropriety of combination of Bowen, as set forth above, is repeated herein and incorporated herein by reference. The rejection combines Roche, Hisamune, Bowen and Imai et al. (EP 0 562 625 A2, hereinafter "Imai") and appears to rely on Imai for the use of various dopant sources. Appellant traverses the combination and respectfully submits that the rejection fails to properly state how the combination of the references provides the recited subject matter and a proper motivation or suggestion to combine. The rejection appears to be relying on earlier statements concerning Roche, Hisamune, and Bowen without defining them. Appellant in turn respectfully traverses in light of the foregoing arguments with respect to Roche, Hisamune and Bowen and in light of the procedural inadequacies of the rejection as stated.

Appellant respectfully requests that the Board reverse the rejections.

9. SUMMARY

For the foregoing reasons, the Appellant respectfully submits that the rejections of claims 1, 2, 4-6, 31, 33-36, and 38-54 should be reversed and that any objections should be withdrawn. An indication of allowability of the pending claims and application is respectfully requested.

Please charge any additional fees to Deposit Account 19-0743.

Respectfully submitted,

GURTEJ S. SANDHU et al.

By their Representatives,


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Date June 15, 2004

By



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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Appeal Brief, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 15th day of June, 2004.

Timothy E. Bianchi
Name



Signature

APPENDIX I

The Claims on Appeal

1. (Previously Presented) A chemical vapor deposition (CVD) process for depositing borophosphosilicate glass films on a substrate surface, the process comprising:
 - disposing the substrate within a chemical vapor deposition reaction chamber;
 - heating the substrate to a temperature within a range of at least 480°C to about 700°C;
 - introducing a gas volume of SiO₂ precursors into the chamber;
 - admitting a gas volume of ozone into the chamber;
 - admitting a dopant source for phosphorus into the chamber;
 - admitting a dopant source for boron into the chamber; and
 - exposing a reaction volume of gases located above the substrate surface within a chemically reactive distance of the substrate to a high intensity light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
 - subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the borophosphosilicate glass film.
2. (Previously Presented) The process of Claim 1, wherein the SiO₂ precursor is selected from the group consisting of TEOS (tetraethylorthosilicate), TMCTS (tetramethylcyclotetrasiloxane), DES (diethylsilane), DTBS (ditertiarybutylsilane), TMOS (tetramethylorthosilicate) and FTES (fluorotriethoxysilane).
4. (Previously Presented) The process of Claim 1, wherein the dopant source for boron is selected from the group consisting of triisopropylborate, TMB (trimethylborate), and TEB (triethylborate), and the dopant source for phosphorus is selected from the group consisting of

TEPo (triethylphosphate), TEPI (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite).

5. (Previously Presented) The process of Claim 1, further comprising introducing a gas volume of a carrier gas into the reaction chamber.

6. (Previously Presented) The process of Claim 5, wherein the dopant source for boron is selected from the group consisting of triisopropylborate, TMB (trimethylborate) and TEB (triethylborate), and the dopant source for phosphorus is selected from the group consisting of TEPo (triethylphosphate), TEPI (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite).

31. (Previously Presented) A method of depositing a silicon dioxide layer on a substrate surface, the method comprising:

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor and ozone;

heating the substrate surface to a temperature of at least 480°C to about 700°C; and

illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than in homogeneous reactions taking place in the chamber outside of the reaction volume; and

subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

33. (Previously Presented) The method of Claim 31, wherein the reaction volume of gas further comprises a carrier gas.

34. (Previously Presented) The method of Claim 31, wherein the reaction volume of gas further comprises a carrier gas selected from the group consisting of the Noble gases, nitrogen and hydrogen.
35. (Previously Presented) The method of Claim 31, wherein the reaction volume of gas further comprises a carrier gas comprising helium.
36. (Previously Presented) The method of Claim 31, wherein ozone comprises approximately 5% to 15% by volume of the reaction volume of gas.
38. (Previously Presented) The method of Claim 31, further comprising:
subjecting the reaction volume of gas to a pressure of approximately 200 torr during deposition of the silicon dioxide layer.
39. (Previously Presented) The method of Claim 31, wherein the SiO₂ precursor is selected from the group consisting of TEOS (tetraethylorthosilicate), TMCTS (tetramethylcyclotetrasiloxane), DES (diethylsilane), DTBS (ditertiarybutylsilane), TMOS (tetramethylorthosilicate) and FTES (fluorotriethoxysilane).
40. (Previously Presented) The method of Claim 31, wherein the reaction volume of gas further comprises at least one dopant source selected from the group consisting of triisopropylborate, TMB (trimethylborate), TEB (triethylborate), TEPO (triethylphosphate), TEPI (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite).
41. (Previously Presented) The method of Claim 31, wherein the reaction volume of gas further comprises at least one dopant source for boron selected from the group consisting of triisopropylborate, TMB (trimethylborate), and TEB (triethylborate), and at least one dopant source for phosphorus selected from the group consisting of TEPO (triethylphosphate), TEPI (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite).

42. (Previously Presented) A method of depositing a doped silicon dioxide layer on a substrate surface, the method comprising:

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor, ozone and at least one dopant source;

heating the substrate surface to a temperature of at least 480°C to about 700°C; and

illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and

subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

43. (Previously Presented) A method of depositing a doped silicon dioxide layer on a substrate surface, comprising:

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor, ozone and at least two dopant sources;

heating the substrate surface to a temperature of at least 480°C to about 700°C;

and

illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and

subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

44. (Previously Presented) The method of Claim 43, wherein the at least two dopant sources comprise a dopant source for boron and a dopant source for phosphorus.

45. (Previously Presented) A method of depositing a borophosphosilicate glass layer on a substrate surface, comprising:

- heating the substrate surface to a temperature of at least 480°C to about 700°C;
- contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, wherein the reaction volume of gas comprises:
 - a SiO₂ precursor selected from the group consisting of TEOS (tetraethylorthosilicate), TMCTS (tetramethylcyclotetrasiloxane), DES (diethylsilane), DTBS (ditertiarybutylsilane) and TMOS (tetramethylorthosilicate);
 - a dopant source for boron selected from the group consisting of triisopropylborate, TMB (trimethylborate), and TEB (triethylborate); and
 - a dopant source for phosphorus selected from the group consisting of TEPO (triethylphosphate), TEPi (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite);
- illuminating the reaction volume of gas from a high intensity light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
- subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

46. (Previously Presented) A method of depositing a fluorosilicate glass layer on a substrate surface, comprising:

heating the substrate surface to a temperature of at least 480°C to about 700°C;
contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a fluorinated SiO₂ precursor and ozone; and
illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume take part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the fluorosilicate layer.

47. (Previously Presented) A method of depositing a doped fluorosilicate glass layer on a substrate surface, the method comprising:

heating the substrate surface to a temperature of at least 480°C to about 700°C;
contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a fluorinated SiO₂ precursor, ozone and at least one dopant source; and
illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

48. (Previously Presented) A method of depositing a doped fluorosilicate glass layer on a substrate surface, the method comprising:

heating the substrate surface to a temperature of at least 480°C to about 700°C;

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a fluorinated SiO₂ precursor, ozone and at least two dopant sources; and

illuminating the reaction volume of gas from a high-intensity light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and

subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the fluorosilicate layer.

49. (Previously Presented) The method of Claim 48, wherein the at least two dopant sources comprise a dopant source for boron and a dopant source for phosphorus.

50. (Previously Presented) A method of depositing a fluoroborophosphosilicate glass layer on a substrate surface, the method comprising:

heating the substrate surface to a temperature of at least 480°C to about 700°C;

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, wherein the reaction volume of gas comprises:

a SiO₂ precursor comprising FTES (fluorotriethoxysilane);

a dopant source for boron selected from the group consisting of triisopropylborate, TMB (trimethylborate), and TEB (triethylborate); and

a dopant source for phosphorus selected from the group consisting of TEPO (triethylphosphate), TEPi (triethylphosphite), TMPo (trimethylphosphate) and TMPi (trimethylphosphite); and

illuminating the reaction volume of gas from a high intensity light source without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the

reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the fluoroborophosphosilicate layer.

51. (Previously Presented) A method of depositing a silicon dioxide layer on a substrate surface, the method comprising:

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor and ozone;

heating the substrate surface to a temperature of at least 480°C to about 700°C; and

illuminating the reaction volume of gas from a light source comprising mercury arc vapor lamps without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

52. (Previously Presented) A method of depositing a doped silicon dioxide layer on a substrate surface, the method comprising:

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor, ozone and at least one dopant source;

heating the substrate surface to a temperature of at least 480°C to about 700°C;

and

illuminating the reaction volume of gas from a light source comprising mercury arc vapor lamps without directly exposing the substrate surface to the light source to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films,

reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and
subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

53. (Previously Presented) A method of depositing a doped silicon dioxide layer on a substrate surface, the method comprising:

heating the substrate surface to a temperature of at least 480°C to about 700°C;

contacting the substrate surface with a reaction volume of gas located above the substrate surface within a chemically reactive distance of the substrate, the reaction volume of gas comprising a SiO₂ precursor, ozone and at least two dopant sources;

illuminating the reaction volume of gas from a light source without directly exposing the substrate surface to the light source, the light source comprising mercury arc vapor lamps to increase the functional atomic oxygen concentration and reduce the fixed charge in the deposited films, reactant gases in the reaction volume taking part in heterogeneous chemical reactions, rather than homogeneous reactions taking place in the chamber outside of the reaction volume; and

subjecting the reaction volume of gas to a pressure of approximately 200 to 760 torr during deposition of the silicon dioxide layer.

54. (Previously Presented) The method of Claim 53, wherein the at least two dopant sources comprise a dopant source for boron and a dopant source for phosphorus.